TITLE: GENERATION, SIZE DISTRIBUTION, AND COMPOSITION OF TOBACCO SMOKE AEROSOLS

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ABSTRACT: This paper reviews past and present research efforts to describe and elucidate the sequence of processes involved in cigarette smoke formation. The generation of the aerosol precursors consisting of hot vapors and minute nuclei in the combustion zone and at elevated temperatures near the coal of the burning cigarette is discussed with regard to the different generating processes like incomplete combustion, pyrolysis, vaporization and sublimation of organic materials. The formation of ions and various condensation nuclei is considered in the light of limited evidence implicating inorganic ashes and carbonaceous matter. In the steep temperature gradient behind the burning zone, a preferred condensation is contemplated which should depend upon the electrical or chemical nature of the nucleus and the affinity of the compound condensing on it. In this way, a primary transient aerosol will develop which consists of very fine droplets or particles of different chemical composition and different growth rate. Because of the potential high supersaturation in the cooling zone, practically all nuclei and ions will finally develop into very small aerosol particles, thus providing a very high particle number concentration of the aerosol. This should give rise to a rapid coagulation which may wipe out most chemical differences for the bigger particles, because coagulation is probably random. Supporting data postulating smoke particles of size-dependent chemical composition will be analyzed and discussed.

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